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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/711,584	09/27/2004	Irene Spitsberg	121492-3	5583
30952 7590 09/10/2008 HARTMAN AND HARTMAN, P.C. 552 EAST 700 NORTH VALPARAISO, IN 46383				
EXAMINER				
TUROCZY, DAVID P				
ART UNIT		PAPER NUMBER		
1792				
NOTIFICATION DATE		DELIVERY MODE		
09/10/2008		ELECTRONIC		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary

Application No.

10/711,584

Applicant(s)

SPITSBERG ET AL.

Examiner

DAVID TUROCY

Art Unit

1792

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 May 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-946)
- 3) ☐ Information Disclosure Statement(s) (PTO/SF/ICE)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Response to Amendment

1. Applicant's amendments, filed 5/28/2008, have been fully considered and reviewed by the examiner. The examiner notes the amendment to claims. The examiner notes the amendment to the specification to update the first line.

Response to Arguments

2. Applicant's arguments filed 5/28/2008 have been fully considered but they are not persuasive.

The applicant argues against the examiners use of Nakamura, teaching of a diffusion aluminide layer, with the teachings of ASA and Rigney, teaching of overlay aluminide coating, stating that the different coatings are physically, chemically, and microstructurally different and thus will not respond the same to the surface treatments and thus the combination of references are in error. The examiner notes that the overlay coating is in fact a diffusion coating, where the applicant's specification clearly discloses that an overlay coating has a diffusion zone (see applicant's specification paragraph 0005) . While the specification clearly discloses that the material deposited as an "overlay" coating does not have a diffusion zone the same depth as a "diffusion coating", the specification fails to appreciate the metes and bounds of the diffusion zone depth for an overlay coating with respect to a diffusion coating.

Additionally, the examiner notes that the Nakamura reference discloses that the treatment method enhances the resistance to thermal fatigue of the surface of a coating layer obtained by known coating treatments, see page 5. Therefore, one of ordinary

skill in the art would reasonably predict successful results in the recrystallization of an overlay coating, which includes a diffusion zone, to enhance the resistance to thermal fatigue of that deposited layer because Nakamura discloses that the recrystallization of a coating deposited by known methods has shown and predictable results. Nakamura discloses selecting a recrystallization temperature that results in fine recrystallized grain layer on the outermost surface of the diffusion coating layer. Additionally, the ASA as shown in application 09/524227 at page 9 discloses that the diffusion coating comprises a diffusion zone (30) and an additive layer (28), see figures 2-3). Since Nakamura discloses that the recrystallization temperature results in fine recrystallized grain layer on the outermost surface of the bond layer and the outmost layer of the bond layer for a diffusion coating and overlay coating are substantially similar, as suggested by ASA, one of ordinary skill in the art would have reasonably expected to the recrystallization treatment as taught by Nakamura to results in fine recrystallized grain layer on the outermost surface of the bond layer. Additionally, Nakamura explicitly discloses that forming fine crystal grains in the vicinity of the surface of the coating layer enhances the resistance to thermal fatigue of the coating layer and fine crystals are known to have high yield strength, see Nakamura page 6. Nakamura discloses that the portions subject to shot peening, i.e. the surface of the coated layer, serve as the nuclei of the new crystal grains when subject to the heat treatment, see page 7.

AAPA, Nakamura et al and Rigney et al each disclose a NiAl bond coating and Nakamura discloses the recrystallization treatment is a surface treatment, therefore one of ordinary skill in the art would have reasonably expected to provide successful results

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in applying the NiAl recrystallization treatment as taught by Nakamura to the NiAl bond coatings as taught by AAPA and Rigney.

The applicant argues that Nakamura is directed solely to recrystallizing diffusion coatings, which contains multiple phases, citing paragraph 8 in the present specification. However, paragraph 8 appears to state that the overlay coatings have multiple phases and the diffusion aluminide coatings are intermetallic.

Terminal Disclaimer

3. The terminal disclaimer filed on 5/28/08 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of 7244467 has been reviewed and is NOT accepted.

The terminal disclaimer does not comply with 37 CFR 1.321(b) and/or (c) because:

The disclaimer fee in accordance with 37 CFR 1.20(d) has not been submitted, nor is there any authorization in the application file to charge a specified Deposit Account or credit card.

Double Patenting

4. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thornton*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

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A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-19 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-20 of U.S. Patent No. 7244467.

Although the conflicting claims are not identical, they are not patentably distinct from each other because the claims of the current application fully encompass those of US Patent 7244467. While US Patent 7244467 fails to disclose recrystallization, causing the outerlayer to form new boundaries, forming new grains with aspect ration smaller than the deposited grains, dissolving precipitates, US Patent 7244467 teaches each and every process step and limitation of the applicant's claims, including the type of aluminate bond coat utilized, the step of peening the bond coat prior to heat-treating the bond coat, and the step of heating the bond coat at a temperature at or above the recrystallization temperature. Since the lack of grain boundary precipitates obtained in the applicant's claimed process is simply a function of the recrystallization (i.e., peening / heating) process utilized by the applicant, and US Patent 7244467 teaches the claimed recrystallization (i.e., peening / heating) process, the process of the US Patent 7244467 would have inherently produced a bond coat with the claimed characteristics.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1, 2, 4-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over the applicant's admitted prior art as established in the prosecution of United States Patent Application 09/524227 (US Patent Application in the present applications family history), hereinafter AAPA, in view of Nakamura et al. (JP 01-180959 A) and further in view of Rigney et al. (US Patent 6153313).

Regarding independent **Claim 1**, the AAPA teaches a method of making a thermal barrier coating (TBC) system by depositing a diffusion aluminide bond coat that adheres the thermal barrier coating to a surface of a superalloy component, the method comprising the step of depositing the diffusion aluminide bond coat on the component so as to be characterized by substantially columnar grains that extend substantially through the portion of the bond coat overlying the surface of the component, the grains having grain boundaries exposed at the surface of the aluminide bond coat, and depositing a ceramic layer on the surface of the aluminide bond coat to form a thermal barrier coating (See "PRIOR ART" Figures 2 – 5, page 8, lines 8 – 34, page 9, lines 1 – 35, and page 10, lines 1 – 24, of the applicant's specification, which depict and describe a TBC system of a type known in the art). The AAPA does not explicitly disclose the aluminide coating comprising a beta-nickel aluminide overcoat. However, Rigney,

teaching beta-phase nickel aluminide coatings are known in the art to provide strength, including an unexpected increase in spallation resistance when using beta phase NiAl bond coats. Rigney discloses such coatings increase creep resistance, fracture toughness and fracture energy compared with other aluminide coatings (column 3). Therefore, it would have been obvious to one of ordinary skill in the art to have modified AAPA to use the beta phase nickel aluminide coating as suggested by Rigney to reap the benefits of increase creep resistance, fracture toughness and fracture energy.

The AAPA in view of Rigney does not explicitly teach improving the thermal fatigue life of the TBC by modifying the grain structure of the aluminide bond coat by recrystallizing at least a surface region of the aluminide bond coat during or prior to depositing the TBC on the surface of the bond coat, wherein new grains form at the surface of the bond coat.

Nakamura et al. teaches that, after depositing a diffusion coating layer of Al (i.e., an aluminide bond coat) on the surface of a gas turbine component such as a blade (i.e., a process analogous to that taught by the AAPA and Rigney), the diffusion coating layer is shot-peened and then heated to a temperature at or above the recrystallization temperature of the coating layer, thereby causing recrystallized grains (i.e., "new grains") to form on the surface of the diffusion coating layer (Abstract). This recrystallization process advantageously allows the component / coating (1) to have an improved thermal fatigue resistance without deteriorating the corrosion resistance, (2) to have a low crack propagation speed due to the small grain size of the recrystallized grains, and (3) to have an increased resistance to the coating layer peeling-off (Abstract). Therefore, it would have been obvious to one of ordinary skill in the art to

improve the thermal fatigue life of the TBC system of the AAPA in view of Rigney by modifying the grain structure of the beta phase nickel aluminide bond coat by recrystallizing at least a surface region of the aluminide bond coat during or prior to depositing the TBC (**Claim 9**) on the surface of the bond coat, wherein new grains form at the surface of the bond coat, as taught by Nakamura et al., with the reasonable expectation of successfully and advantageously providing the coated superalloy component / blade of the AAPA in view of Rigney with the following benefits: (1) an improved thermal fatigue resistance, (2) a lower crack propagation speed, and (3) an increased resistance to the peeling-off of the coating layer (i.e., the TBC system).

With respect to the requirement of precipitates: Precipitates are present in the grain boundaries of the grains after the depositing step and before recrystallization (see, for example, page 9, lines 29 – 35 of the specification), and the precipitates are substantially absent (**claim 6**) (i.e. fewer precipitates present than the as deposited grain boundaries) from the grain boundaries of the new grains after recrystallization. Specifically, the combination of the AAPA, Rigney, and Nakamura et al. is silent regarding precipitates at the grain boundaries after recrystallization. However, the combination of the AAPA, Rigney, and Nakamura et al. teaches each and every process step and limitation of the applicant's claims, including the type of aluminide bond coat utilized, the step of peening the bond coat prior to heat-treating the bond coat, and the step of recrystallizing the bond coat by heating the bond coat at a temperature at or above the recrystallization temperature. Since the lack of grain boundary precipitates obtained in the applicant's claimed process is simply a function of the recrystallization (i.e., peening / heating) process utilized by the applicant, and the

combination of the AAPA, Rigney, and Nakamura et al. teaches the claimed recrystallization (i.e., peening / heating) process, the process of the combination of the AAPA, Rigney, and Nakamura et al. would have inherently produced a bond coat having substantially no precipitates at the grain boundaries after recrystallization unless essential process steps and/or limitations are missing from the applicant's claims.

With respect to the requirement of forming new equiaxed grain: Equiaxed grain are present in the after the recrystallization step. Specifically, the combination of the AAPA, Rigney, and Nakamura et al. is silent regarding equiaxed grain are present in the after the recrystallization step. However, the combination of the AAPA, Rigney, and Nakamura et al. teaches each and every process step and limitation of the applicant's claims, including the type of aluminide bond coat utilized, the step of peening the bond coat prior to heat-treating the bond coat, and the step of recrystallizing the bond coat by heating the bond coat at a temperature at or above the recrystallization temperature. Since the equiaxed grain are present in the after the recrystallization step obtained in the applicant's claimed process is simply a function of the recrystallization (i.e., peening / heating) process utilized by the applicant, and the combination of the AAPA, Rigney, and Nakamura et al. teaches the claimed recrystallization (i.e., peening / heating) process, the process of the combination of the AAPA, Rigney, and Nakamura et al. would have inherently produced a bond coat having equiaxed grain are present in the after the recrystallization step unless essential process steps and/or limitations are missing from the applicant's claims.

- Claim 2: The new grains have an average aspect ratio smaller then the average aspect ration of the as deposited grain. Specifically, although

Nakamura et al. teaches that the new grains are "small" and "fine" (Abstract), Nakamura et al. is silent as to the comparison between as deposited to that of the recrystallized grains. However, the combination of the AAPA, Rigney, and Nakamura et al. teaches each and every process step and limitation of the applicant's claims, including the type of aluminide bond coat utilized, the step of peening the bond coat prior to heat-treating the bond coat, and the step of recrystallizing the bond coat by heating the bond coat at a temperature at or above the recrystallization temperature. Since the grain size obtained by the applicant's claimed process is simply a function of the recrystallization (i.e., peening / heating) process utilized by the applicant, and the combination of the AAPA, Rigney, and Nakamura et al. teaches the claimed recrystallization (i.e., peening / heating) process, the process of the combination of the AAPA, Rigney, and Nakamura et al. would have inherently produced new grains having an average aspect ratio of the new grain that is smaller than the average aspect ratio of the as deposited aspect ratio unless essential process steps and/or limitations are missing from the applicant's claims.

- Claim 4: Nakamura et al. discloses heat treatment for recrystallization. Specifically, Nakamura et al. teaches heating the bond coat to a temperature at or above the recrystallization temperature of the coating (Abstract) and gives a specific example of heating to a temperature of 900° C (sections (9) and (10) of Nakamura et al., as verified by an oral translation from a USPTO translator). Additionally, Rigney discloses heating above 980°C in a argon (low-oxygen) atmosphere. It would have been obvious to one of ordinary skill

in the art to utilize a high heat treatment temperature of, for example, above 980°C in an argon atmosphere (as taught by Rigney et al.), in the process of the combination of the AAPA, Rigney, and Nakamura et al. with the reasonable expectation of (1) success, as Nakamura et al. teaches heating the bond coat to a temperature at or above the recrystallization temperature of the coating (i.e., does not appear to place an upper limit on the heat treatment temperature) and (2) obtaining the benefit of using a higher heat treatment temperature than the 900° C temperature explicitly taught by Nakamura et al., such as performing the recrystallization more quickly, thereby increasing process throughput. Additionally, taking the references collectively, it would have been obvious to have selected the heating of Rigney as the heating for Nakamura with a reasonable expectation of predictable results.

- Claim 5: Some of the precipitates are dissolved during the heating step. Specifically, Nakamura et al. and Rigney disclose heating step of the nickel aluminide layer but are silent about dissolving precipitates. However, the combination of the AAPA, Rigney, and Nakamura et al. teaches each and every process step and limitation of the applicant's claims, including the type of aluminide bond coat utilized, the step of peening the bond coat prior to heat-treating the bond coat, and the step of recrystallizing the bond coat by heating the bond coat at a temperature at or above the recrystallization temperature. Since the grain orientation obtained by the applicant's claimed process is simply a function of the recrystallization (i.e., peening / heating)

process utilized by the applicant, and the combination of the AAPA, Rigney, and Nakamura et al. teaches the claimed recrystallization (i.e., peening / heating) process, the process of the combination of the AAPA, Rigney, and Nakamura et al. would have inherently dissolve precipitates unless essential process steps and/or limitations are missing from the applicant's claims.

- Claim 7-8: The precipitates are zirconium rich particles contained in the overlay coating. Specifically, Rigney discloses beta phase nickel aluminide coating including zirconium particles (Table 1). Additionally, the combination of the AAPA, Rigney, and Nakamura et al. teaches each and every process step and limitation of the applicant's claims, including the type of aluminide bond coat deposited, the step of peening the bond coat prior to heat-treating the bond coat, and the step of recrystallizing the bond coat by heating the bond coat at a temperature at or above the recrystallization temperature. Since the precipitate in the applicant's claimed process is simply a function of the deposited overlay material and the recrystallization (i.e., peening / heating) process utilized by the applicant and the combination of the AAPA, Rigney, and Nakamura et al. teaches the claimed recrystallization (i.e., peening / heating) process, the process of the combination of the AAPA, Rigney, and Nakamura et al. would have inherently have precipitates that are zirconium rich unless essential process steps and/or limitations are missing from the applicant's claims.
- Claim 10: Rigney discloses deposited the beta phase nickel aluminide coating by PVD methods (Table IV). The other limitations of this claim are

addressed in detail above and AAPA, Rigney, and Nakamura et al. are applied for the reasons set forth above.

- Claim 11, 12, 14, 15, and 16: The limitations of these claims are explicitly discussed above and AAPA, Rigney, and Nakamura et al. are applied against these claims for the same reasons as set forth above.
- Claim 17 and 18: Rigney discloses a beta phase nickel aluminide overlay coating consisting aluminum, zirconium, chromium, and nickel in the ranges as claimed (Table I, IV, column 6 lines 65-68).
- Claim 19: The limitations of this claim are discussed above, specifically, AAPA, discloses ceramic coating as discussed with regards to claim 9.

1. **Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA in view of Rigney (US Patent 6153313) and Nakamura et al. (JP 01-180959 A), and in further view of Lee et al (USPN 6,375,425).**

The combination of the AAPA, Rigney, and Nakamura et al. teaches all the limitations of **Claim 3** as set forth above, including Rigney discloses the NiAl bond coating is deposited using PVD or electron beam deposition (Column 5, lines 18-25), however, the references fail to disclose a method wherein the aluminide bond coat is deposited at a substrate temperature of 1050°C or more to induce recrystallization. However, Lee, teaching of similar NiAl coatings, discloses depositing the layer using any known technique, including among others physical vapor deposition and electron beam deposition, and discloses substrate temperatures of 1600°F or more (871.1°C or more). Therefore, it would have been obvious to one of ordinary skill in the art to have utilized deposition temperatures as taught by Lee with a reasonable expectation of

depositing the desired beta phase NiAl coating because such coatings are known to be deposited using PVD or EB processes and Lee discloses substrate temperatures for such processes are known to be 1600°F or more, and In the case where the claimed ranges “overlap or lie” inside ranges disclosed by prior art a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257 191 USPQ 90. See MPEP 2144.05.

Additionally, The PVD or EB deposition of beta phase nickel aluminide at a temperature induces recrystallization of the overlayer. Specifically, while Rigney discloses depositing such a layer using PVD or EB techniques and Lee discloses such at completed at substrate temperatures of 1600°F or more, the references are silent as to the substrate temperature inducing recrystallization. However, the combination of the AAPA, Rigney, Nakamura et al., and Lee teaches each and every process step and limitation of the applicant’s claims, including the type of aluminide bond coat utilized, the step of depositing the bond coat at the specified temperature, peening the bond coat prior to heat-treating the bond coat, and the step of recrystallizing the bond coat by heating the bond coat at a temperature at or above the recrystallization temperature. Since the inducement of recrystallization obtained by the applicant’s claimed process is simply a function bond coat deposition (i.e., PVD or EBPVD / heating) process utilized by the applicant, and the combination of the AAPA, Rigney, Nakamura et al., and Lee teaches the claimed deposition (i.e., PVD or EBPVD / heating) process, the process of the combination of the AAPA, Rigney, Nakamura et al., and Lee would have inherently induce recrystallization of the bond coat unless essential process steps and/or limitations are missing from the applicant’s claims.

Conclusion

2. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID TUROCY whose telephone number is (571)272-2940. The examiner can normally be reached on Monday-Friday 8:30-6:00, No 2nd Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/David Turocy/
Examiner, Art Unit 1792

/Timothy H Meeks/
Supervisory Patent Examiner, Art Unit 1792